The Magazine for ENERGY EFFICIENCY in Compressed Air Systems

COMPRESSED AIR BEST PRACTICES

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March 2018

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FROM THE EDITOR | Pharmaceutical Air

Dew point suppression (DPS) is an interesting topic leading to optimized reliability and energy consumption related to compressed air dryers. I spoke recently to an Energy Manager, from a major pharmaceutical concern, who said he often asks the question, "Do we really need a -40 ˚F (-40 ˚C) dew point year-round for the ***entire*** plant?" Colin Billiet, the former CEO for domnick hunter, has provided us with an interesting article about an innovative adsorption medium his new firm has developed. The objective of this "Skroll" adsorption medium is to assist pressure-swing (heatless) desiccant air dryers and to focus more on DPS than on one number in a dew point specification.

The Centrifugal Compressor Section of the Compressed Air and Gas Institute (CAGI) has provided us with a sound article on the benefits of centrifugal air compressors. Member companies of this section are Atlas Copco, Ingersoll Rand, FS Elliott and Hanwha Techwin. Saying they are "best suited for air compressors above 200 horsepower," the article lists oil-free Class 0 air, lower maintenance requirements and energy efficiency as the primary advantages centrifugal air compressor technology provides.

Chillers, compressed air and vacuum system optimization was our focus at the 2018 International Production & Processing Expo (IPPE), produced by the US Poultry & Egg Association (an all-feather organization they say!), the American Feed Industry Association and the North American Meat Institute. We hope you enjoy our show report.

I did an informal survey six months ago of a sampling of our subscribers who are Energy Managers for multi-factory organizations asking, "What content are you most interested in?" One consistent reply was, "Information on compressed air system design errors." We are therefore launching a new column titled, "Missed Opportunities in Compressed Air System Design," authored by Hank van Ormer. His first installment focuses on flow restrictions in pipe headers.

Speaking of opportunities to learn how to improve systems, you may have heard, we are launching the inaugural 2018 Best Practices Expo & Conference, September 17-19, 2018 at the Chicago O'Hare Crowne Plaza. We will soon be announcing an exciting line-up of speakers including Keynote Speakers from General Mills and Shaw Industries. Please consider putting this event on your calendar and registering for the event at www.cabpexpo.com.

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Thank you for investing your time and efforts into ***Compressed Air Best Practices®***.

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Inaugural 2018 Best Practices EXPO Announces ComEd as Host Utility Sponsor

Improving plant profitability by optimizing compressed air systems is the focus of the inaugural 2018 Best Practices EXPO & Conference, to be held at the Chicago O'Hare Crowne Plaza Conference Center, September 17-19, 2018. Compressed Air Best Practices® Magazine Publisher, Rod Smith said, "After 11 years of publishing "Best Practice" stories, we're thrilled to create an opportunity for our subscribers to share knowledge and view technology in-person."

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2018 EXPO SEPTEMBER 17-19 CHICAGO O'HARE, IL
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The 3-day four-track conference will convene the leading experts, from the compressed air industry and manufacturing plants, to teach how to measure, reduce demand and optimize compressed air system designs. The event will also dedicate exhibit floor space and conference time to optimizing blower, vacuum, cooling and chiller systems.

The EXPO floor will feature approximately 65 booths displaying the technologies needed to optimize compressed air systems. Smith said, "We'd like to thank our Sponsors and are honored and motivated by the compressed air industry's vigorous support of this new event."

The Best Practices EXPO & Conference is thrilled to announced ComEd® as the Utility Host Sponsor of The Best Practices EXPO & Conference is thrilled to announced ComEd® as the Utility Host Sponsor of the event. ComEd is the largest electric utility in Illinois and provides service to approximately 4 million customers across Northern Illinois, 70% of the state's population. As a Utility Host Sponsor, ComEd will be speaking at either the Opening or Plenary Session, as well as chairing a conference session on Utility Incentive Programs. ComEd will be featured on the EXPO floor at booth 301. At their 10x20 booth they will be displaying ways their ComEd Energy Efficiency Program can help factories implement efficient solutions that save energy, while improving production and reducing waste.

ComEd Energy Efficiency Program

To register for the 2018 Best Practices EXPO & Conference, please visit www.cabpexpo.com and for exhibition/sponsorship opportunities contact Rod Smith, Tel (412) 980-9901, email: rod@airbestpractices.com.

Atlas Copco USA Continues Partnership with Stewart-Haas Racing

Atlas Copco USA announced a continuation of its longstanding partnership with Stewart-Haas Racing (SHR) for the upcoming 2018 racing season. Atlas Copco has been involved with SHR since its inception, and serves as a technical partner to the championship-winning NASCAR team.

"We're excited about having Atlas Copco as a continued partner and sponsor for our 2018 racing season," said Greg Zipadelli, SHR's vice president of competition. "Their products are crucial in providing the quality compressed air our teams need to get the job done quickly, efficiently and reliably."

Established by three-time Monster Energy NASCAR Cup Series champion Tony Stewart and Haas Automation founder Gene Haas, SHR fields entries for four drivers. These four drivers are, Kevin Harvick, Aric Almirola, Clint Bowyer and Kurt Busch in the Monster Energy NASCAR Cup Series and the NASCAR XFINITY Series. Based in Kannapolis, North Carolina, SHR operates out of a 200,000-square-foot facility with nearly 370 employees.

"Atlas Copco and Stewart-Haas Racing have shared a successful relationship since 2009," said Erik Arfalk, Atlas Copco's vice president of communications and branding. "We're thrilled about extending our partnership and working together again in this upcoming season."

Atlas Copco USA announced a continuation of its partnership with Stewart-Haas Racing for the 2018 racing season.

Atlas Copco provides all of SHR's compressed air equipment, utilizing the SMARTLINK monitoring technology inside SHR's state-of-the-art race shop. SMARTLINK provides 24/7 remote monitoring of the team's compressed air system to ensure continuous uptime, peak performance and energy efficiency.

"There's very little downtime in racing, so it's our job to keep the crews supplied with the best possible compressed air that's guaranteed to perform whenever it's needed," said Arfalk. "We can't wait for the start of the season and our ongoing work with Stewart-Haas Racing."

About Stewart-Haas Racing

Stewart-Haas Racing is the title-winning NASCAR team co-owned by three-time Monster Energy NASCAR Cup Series champion Tony Stewart and Gene Haas, founder of Haas Automation – the largest CNC machine tool builder in North America. The organization fields four entries in the Monster Energy NASCAR Cup Series – the No. 4 Ford Fusion for Kevin Harvick, the No. 10 Ford Fusion for Aric Almirola, the No. 14 Ford Fusion for Clint Bowyer and the No. 41 Ford Fusion for Kurt Busch. The team also competes in the NASCAR XFINITY Series by fielding a full-time entry – the No. 00 Ford Mustang for Cole Custer – and one part-time entry – the No. 98 Ford Mustang. Based in Kannapolis, North Carolina, Stewart-Haas Racing operates out of a 200,000-square-foot facility with nearly 370 employees. For more information, please visit us on the Web at www.StewartHaasRacing.com, on Facebook at www.Facebook.com/StewartHaasRacing, on Twitter @StewartHaasRcng and on Instagram @StewartHaasRacing.

About Atlas Copco

Atlas Copco is a world-leading provider of sustainable productivity solutions. The Group serves customers with innovative compressors, vacuum solutions and air treatment systems, construction and mining equipment, power tools and assembly systems. Atlas Copco develops products and service focused on productivity, energy efficiency, safety and ergonomics. The company was founded in 1873, is based in Stockholm, Sweden, and has a global reach spanning more than 180 countries.

INDUSTRY NEWS

In 2014, Atlas Copco had revenues of BSEK 94 (BEUR 10.3) and more than 44 000 employees. Learn more at www.atlascopco.com.

About Atlas Copco North America

Atlas Copco North America operates 125 locations and employs more than 4,900 people in the United States. Approximately one-fifth of the company's global revenue comes from North America. Learn more at www.atlascopco.us.

Vaisala Opens New Office in Mexico

Vaisala, the leading provider of environmental and industrial measurement solutions, launched a new office in Mexico. With the office opening, Vaisala is responding to the growing demand for both industrial and weather measurement instruments and services in Latin America. As a region with many cultures, strong economies and versatile industries, Latin America is an emerging market offering vast growth opportunities for businesses.

"The decision to expand our presence in Latin America was a logical step in our business growth strategy," said Sampsa Lahtinen, Vaisala Industrial Measurements' executive vice president. "We see great opportunities in the Latin American market. It is a very dynamic region holding enormous potential due to the growing population and the emerging industry."

Vaisala's new office is located in Socrates #140 Floor 2, Polanco, Mexico City, Mexico.

"Mexico is a convenient location for the new office, as the Mexican economy is welcoming new players and the trade agreements make it an inviting country to strengthen our presence", says Madjid Ouali, Vaisala Industrial Measurements in Latin America's office manager and sales director. "We hope to see our presence accelerating interaction with our customers. This new office will increase our ability to serve current and future markets," Ouali continues.

Vaisala has been present in Latin America for decades. Vaisala established a subsidiary in Rio de Janeiro in 2012, serving Vaisala's Weather and Environment business in Brazil. Today, the company has customers in every Latin American country.

"We are happy to serve our customers better in Latin America by expanding our presence to Mexico. Our office in Rio de Janeiro continues to deliver high-quality weather and air quality observation systems to our customers in Latin America in the face of increasing amount of extreme weather and pollution related issues in the region," says Aleksis Kajava, Vaisala Weather and Environment's head of Latin America.

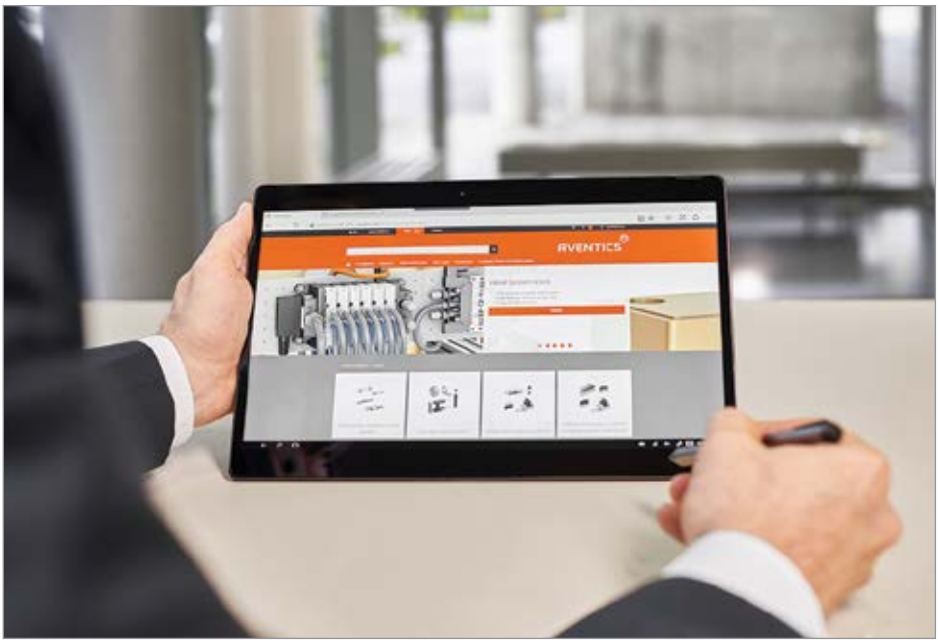
The office opening was held at the Ambassador of Finland's, Mr. Roy K. Eriksson, residence in Mexico. At the opening event, the Ambassador congratulated the Vaisala team and endorsed the Embassy's support for the new office. "Commercial ties between Finland and Mexico are growing and I am very pleased that almost 40 Finnish companies are already present in Mexico. I am proud that a company as well-known as Vaisala now has a solid presence in Mexico. I am certain that this decision will strengthen the company in all its activities in this region", commented Ambassador Roy K. Eriksson.

About Vaisala

Vaisala is a global leader in environmental and industrial measurement. Building on over 80 years of experience, Vaisala provides observations for a better world. We are a reliable partner for customers around the world, offering a comprehensive range of innovative observation and measurement products and services. Headquartered in Finland, Vaisala employs approximately 1,600 professionals worldwide and is listed on the Nasdaq Helsinki stock exchange. www.vaisala.com www.twitter.com/VaisalaGroup

Aventics Launches Pneumatics Shop in U.S.A.

The pneumatics specialists from Aventics will now offer their customers in the United States an innovative service and product portal.



The pneumatics specialists from Aventics will now offer their customers in the United States an innovative service and product portal.

INDUSTRY NEWS

Available at www.pneumatics-shop.us, the portal helps to quickly and easily find information on components and solutions tailored to the requirements of engineers and purchasers. At the same time, the portal's lean structures and processes speed up the online order processes. The cross-industry portal is intended for manufacturers, including OEMs, users, distributors and engineering firms for industrial automation, as well as the commercial vehicle, food, railway, medical, energy, and marine technology sectors.

The United States is one of the first countries in the world where Aventics offers its customers the new portal. The previous shop system has been transferred to the new portal, making the ordering process even easier. The new one-stop-shop solution combines all relevant applications in the new portal. The central search function simplifies searching and enables customers to find specific information, from operating instructions and brochures, to technical data and specifications. At the same time, lean structures and processes speed up the order process. Customers can also access "myAVENTICS," a personalized service area where they can view orders and offers, track deliveries, download delivery-relevant documents and submit product feedback.

"Our components ensure state-of-the-art technical solutions for our customers. Our innovative product portal simplifies the order process, as well as searches for information. We'd like to enable our customers and partners to find the perfect solution that will help them even faster," states Andreas Hart, Aventics' director of digital business.

Taking Advantage of Digitalization

With its new portal, Aventics addresses the needs of small and medium-sized enterprises in particular, companies often looking for ultra-customized solutions. "Digitalization offers outstanding opportunities to create added value for partners and customers. With our digital portal, we offer excellent service around the clock – and its intelligence lies in its simplicity," says Hart. "In the age of digital transformation, customers increasingly expect to be able to apply their experiences as end consumers to business-to-business platforms. Our portal provides solutions tailored to customer-specific needs. This makes it easy for our customers to work with us. And we will expand these personalized offerings in the future."

About Aventics

Aventics is one of the world's leading manufacturers of pneumatic components, systems, and customer-specific applications. The pneumatic engineering company provides products and services for industrial automation, while additionally focusing on the sectors of commercial vehicles, food and beverage, railway technology, life sciences, energy, and marine technology. By integrating electronics, the use of innovative materials and prioritizing trends such as machine safety and the Internet of Things, Aventics is a pioneer in applied and environmentally-friendly solutions. With around 150 years of expertise in pneumatics, Aventics employs approx. 2,000 associates worldwide. In addition to production sites in Germany (Laatzen), France (Bonneville), Hungary (Eger), USA (Lexington), and China (Changzhou), Aventics is represented in more than 90 countries through direct sales and dealers. The Aventics Group has received multiple certifications, including ISO 9001 and ISO/TS 16949 for quality, ISO 50001 for energy management, and ISO 14001 for environmental management. For more information, please visit www.aventics.com.

Motivair Announces Iain Beadle as CEO

Iain Beadle has joined Motivair as CEO. Iain has an extensive background in building and growing B2B industrial service organizations, including the last five years at Synectics plc. as a managing director. Iain brings experience in the implementation and delivery of large scale Technology Engineering led projects, emergence service and PPM based contracts, as well as the efficient deployment of rapid response engineering. All of which represent the core product offering at Motivair Compressors.

INDUSTRY NEWS

Iain Beadle has joined Motivair as CEO.

Iain commented, "I am delighted to have the opportunity to lead Motivair through its next stage of development. Motivair's market and customer value proposition are extremely strong and I look forward to meeting some of our customers and suppliers over the next few months."

About Motivair

Motivair is the UK's largest national compressed air management company. With more than 60 years of experience, Motivair ensures continuous compressed air supply, no matter where you are in the UK. As a totally independent provider, Motivair maintains, repairs, installs all brands of low pressure compressors, high pressure compressors, blower and vacuum pumps, regardless of brand, size or age. Other services include 24-hour breakdown response, breathing air compressors, helium recovery systems, medical gases, gas compression, turnkey design and installations.

Through its nationwide force of employed engineers Motivair serves a diverse range of markets including: Aerospace & Defence; Facilities Management; Food & Drink; Manufacturing; Petrochemicals; Pharmaceuticals; Retail and Utilities. For more information, please visit www.motivair.co.uk.

Cook Compression Launches Authorized Service Partner Program in Europe

Cook Compression is proud to announce its certification of three Authorized Service Partners for valve and packing case repairs: Kompresory Veselý, in the Czech Republic; Rudos Ruzomberok, in the Slovak Republic; and Runtime Engineering AB, in Sweden. These companies are the first such partners for Cook Compression in Europe.

Cook Compression applies its technical expertise, application knowledge and state-of-the-art product and material capabilities to improve reciprocating compressor performance around the globe. Through Authorized Service Partners, Cook Compression aims to make its expertise and quality service more readily available to reciprocating compressor end users throughout Europe.

Authorised Service Partners have passed a rigorous audit of their processes and equipment, are held to strict quality standards and guarantee their work for warranty periods as established by Cook Compression. Service capabilities apply to any brand compressor valve or packing case. Further, each valve leaving the partners' facilities will be quality tested using a specially designed Cook Compression valve air test bench.

Kompresory Veselý has 25 years of compressor experience, and a reputation for exceptional customer service. A major service provider for PET compressors in the Czech Republic and neighboring countries, Kompresory Veselý is also expanding its service into petrochemical and other industries. The company's highly skilled, local staff provides high-quality service, emergency response and turnkey management to keep compressors running at peak performance.

Rudos was established in 1996 in the field of railway brake compressor repair, and today continues to provide comprehensive solutions to that market, as well as biogas applications. Rudos combines the most up-to-date technologies with a skilled team to be a leader in the field of compressed air, alternative energy, treatment plant technology and rolling stock. With 18 technicians working from three locations, the company provides flexible, reliable service to more than 500 clients in Slovakia.

Runtime Engineering is a newly formed unit of the Erinova Group dedicated to reciprocating compressor and industrial fan spare parts and services in the Scandinavian market. Runtime Engineering draws on the expertise of its sister companies, the Sweden-based Protoma and MLT. Protoma, founded in 1994, specializes in industrial sealing

INDUSTRY NEWS

solutions such as mechanical seals, packings, gaskets, compensators and hydraulic seals. MLT, founded in 1988, focuses on industrial measurement technology, including condition monitoring, laser alignment, balancing and 3D scanning. Altogether, Erinova Group has 60 employees providing trusted products, service and customer training.

"By putting Cook Compression's long experience in providing OEM-quality reciprocating compressor components behind the trusted regional positions of these partners, we can offer reciprocating compressor end users a higher standard of service," said Dean Lewis, Cook Compression VP Aftermarket, Europe & Russia. "This mutually supportive relationship takes the best of our companies and puts it to work for our customers."

About Cook Compression

Cook Compression provides engineered solutions to increase compressor reliability, offering reciprocating compressor components, repair, field mechanical services and turnkey project management. Cook Compression is a major global presence, with ISO 9001:2000-certified manufacturing centers, repair facilities and technical sales representatives around the world. Cook Compression is an operating company of Dover. For more information, visit www.cookcompression.com.

TriNova Inc. Named Endress+Hauser Sales Representative in New England

Endress+Hauser is pleased to announce TriNova Inc. is its exclusive Sales Representative and Authorized Service Provider in New England and upstate New York. This region includes the states of Maine, Vermont, New Hampshire, Massachusetts, Rhode Island, Connecticut and upstate New York.

TriNova Inc. is a long-time representative and business partner of Endress+Hauser. The company is the automation supplier's Sales Representative and Authorized Service Provider in the southeast and has now expanded its operations in New England and upstate New York from new offices in Ballston Spa, NY.

"We are excited to expand TriNova's area of representation with Endress+Hauser," said Robbie Watson, Chief Executive Officer, TriNova. "We will be working hard to earn

TriNova Inc. has now expanded its operations in New England and upstate New York from new offices in Ballston Spa, NY.

the respect and loyalty of customers within our new region. Our plans are to bring unparalleled service, training and product support to the northeast."

The two companies have spent the last three months preparing for a smooth transition by staffing the new office and training personnel. Teams have been established and are ready to provide customers in the new territory with dedicated support and services in all markets and industries.

"We are pleased to have the opportunity to expand our partnership with TriNova in the New England and upstate New York region," said Chris English, Vice President of Sales, Endress+Hauser. "TriNova has been a leader in innovation when it comes to providing service and support for our customers. The unwavering confidence I have in our partnership and TriNova's northeast leadership team stems from their commitment, expertise and dedication to help our customers reach their goals and overcome challenges. We look forward to working alongside them, helping to improve our customers' processes sustainably and efficiently."

TriNova Inc. has been helping customers with measurement and process challenges for more than 50 years. They have a passion for serving customers with Endress+Hauser instrumentation, technology, solutions and services. Together, Endress+Hauser and TriNova Inc. will provide an unparalleled offering for customers.

For more information, visit www.us.endress.com/TriNovaInc.

About TriNova Inc.

TriNova Inc. was founded by Frank A. Thomas in 1954 and for the last twenty years TriNova, Inc. has been led by CEO and majority stock holder Robbie Watson. The corporation has been providing clients solutions and services for more than 50 years and its goal is to continue to assure customer's requests are handled in a professional and timely manner with trained professional personnel. For more information about TriNova Inc. visit www.trinovainc.com. To contact TriNova, email: NESales@trinovainc.com, telephone: 518-490-9959.

About Endress+Hauser in the U.S.

Endress+Hauser is a global leader in measurement instrumentation, services and solutions for industrial process engineering. Endress+Hauser provides sensors, instruments, systems and services for level, flow, pressure and temperature measurement as well as analytics and data acquisition. We work closely with the chemical, petrochemical, food & beverage, oil & gas, water & wastewater, power & energy, life science, primaries & metal, renewable energies, pulp & paper and shipbuilding industries. Endress+Hauser supports its customers in optimizing their processes in terms of reliability, safety, economic efficiency and environmental impact. The Group employs 13,000 personnel worldwide and generated more than 2.2 billion dollars in 2016. For further information, please visit www.endress.com.

The Endress+Hauser Group

Endress+Hauser is a global leader in measurement instrumentation, services and solutions for industrial process engineering. The Group employs 13,000 personnel across the globe, generating net sales of more than 2.1 billion euros in 2016.

Innovative Adsorption Medium for PRESSURE SWING DESICCANT AIR DRYERS

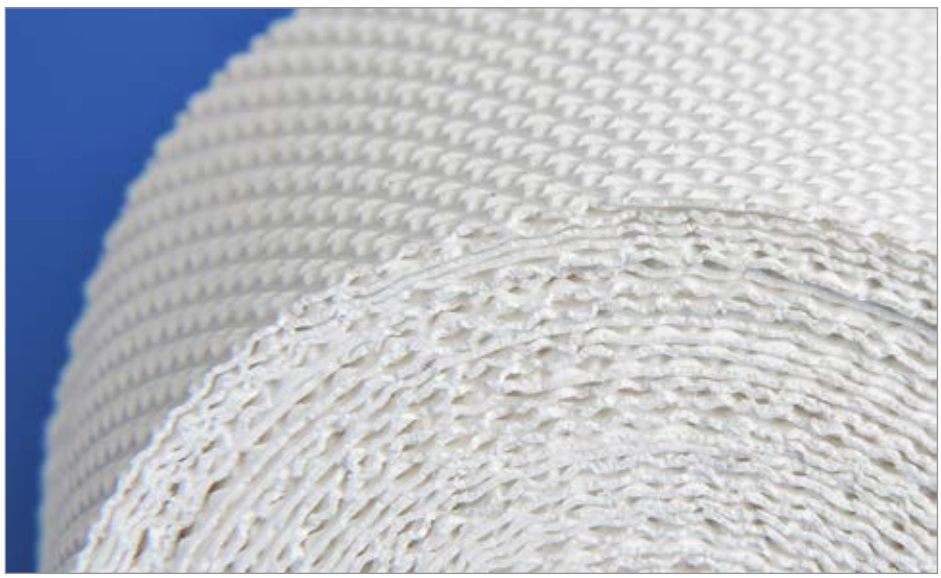
By Colin Billiet, CEO, Air Purification Skroll

➤ Introduction

Compressed air contains contaminants such as dirt, water and oil which must be removed before use. ISO8573.1 specifies air quality classes for these contaminants. Humidity is expressed in terms of Pressure Dew Point (PDP). PDP is the temperature at which air is fully saturated with moisture, when the air temperature falls below this point further condensation will occur.

Condensed water vapor within the compressed air system is by far the major contaminant, which if left untreated, leads to the malfunction of equipment, corrosion, product spoilage and bacterial growth. Freezing of condensate is of particular concern in outdoor and mobile applications during the winter months.

Desiccant air dryers are used for high purity applications where PDP's of -40 ˚C/F are required according to ISO8573.1 humidity class 2. In many applications however, there is a demand for the air to maintain a low Relative Humidity (RH) over a wide range of ambient temperatures e.g. -40 ˚C to +40 ˚C (-40 ˚F to 104 ˚F). Specifying %RH or Dew Point Suppression (DPS) enables optimized sizing of dryers for the application. This avoids oversizing and excessive purge air use, and provides protection over a wide range of seasonal temperature and humidity variations. For example, 20% RH closely corresponds to a DPS of 40 ˚C (72 ˚F).

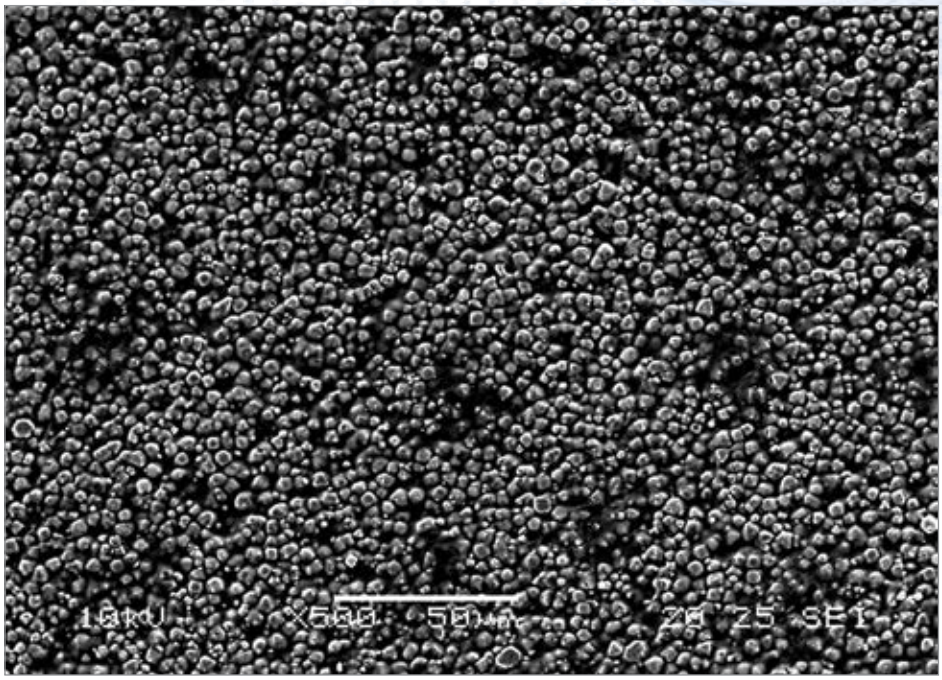


A close-up view of the Skroll adsorption medium

Skroll Adsorbent Technology

Air Purification Skroll adsorption medium is revolutionary (patents pending). It consists of adsorbent crystals immobilised in a durable polymer support structure. It is produced in the form of a continuous sheet, typically 1 mm (0.04") in thickness. When converted into a Skroll construction, flow paths are created between layers. This enables optimum performance to be achieved in applications such as dehydration of air and gases. It is tough and durable, recovers from misuse and has long service life.

When Skroll medium is incorporated into a compressed air dryer it provides a very robust long-life product. Skroll media's durability ensures that even if flooded with water



An image of the adsorptive medium

INNOVATIVE ADSORPTION MEDIUM FOR PRESSURE SWING DESICCANT AIR DRYERS

condensate or subjected to excessive air flow, it will, once normal conditions are resumed, fully recover its performance. Skroll's polymeric binder ensures high chemical resistance (a known issue with semi-permeable membranes) and does not shed dust (a known issue with desiccant beads). This unique medium provides extremely stable dew point suppression, anywhere between that achieved by refrigerated and desiccant dryers. It can operate in a horizontal orientation and is not effected by pulsation from piston compressors.

Skroll medium is readily available in roll or sheet form to be fitted into new or existing PSA dryer designs. It can also be provided in cartridge form to suit customer requirements.

Fast Kinetics-Lower Purge Air-Stable Dew Points

Skroll medium has a very open structure with fast kinetics. The SEM shows the surface of Skroll medium where each adsorption crystal is fully exposed on both sides to the adsorption/desorption process.

Example of Skroll medium being loaded into an aluminum tube. Internal diameter 62 mm (2.44") bore x 218 mm (8.6") long. Inlet flow capacity at 7 bar (100 psig) is 280 Nl/min (10 scfm) for a 40 ˚C (72 ˚F) dew point suppression.

This means regeneration is very efficient requiring less energy. When the medium is exposed to excessive flow or higher temperatures, with the resultant increase in water vapor load, Skroll adsorption medium is not overwhelmed. DPS will reduce to a new and stable dew point but fully recover when normal conditions resume. In such conditions a beaded desiccant bed is likely to be ruined, since regeneration air would no longer be dry enough to carry out regeneration. This results in a downhill spiral leading to the loss of the beaded adsorbent bed through saturation. As the bed becomes saturated, the crush strength of the beads reduces significantly and the adsorbent beads will turn to dust. This may combine with condensate and spread downstream, causing malfunction or damage to pneumatic equipment.

Principles of Operation (PSA)

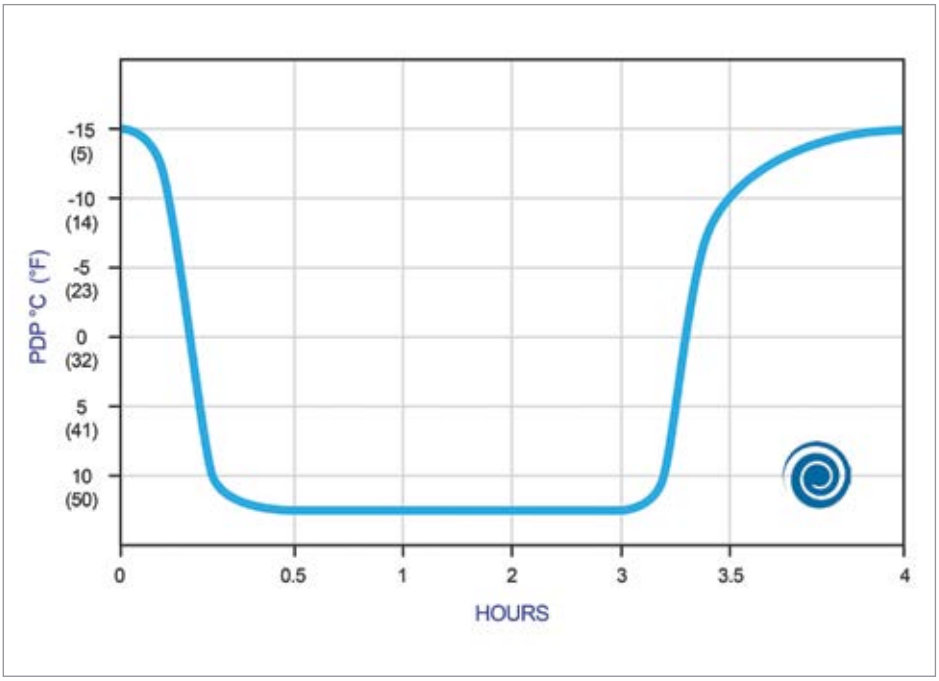
Heatless desiccant dryers are commonly used due to their simplicity. A heatless twin tower Pressure Swing Adsorption (PSA) dryer operates by removing moisture from the pressurised feed air by adsorption onto a desiccant bed (column A), typically at 7 bar (100 psig). A second column B (having previously been used in drying the air) is at atmospheric pressure and dry air from the outlet of column A is fed through a purge valve, expanded to near

"Skroll technology is highly efficient, reliable and requires little or no maintenance. The medium has been developed for demanding applications in the purification of compressed air."

— Colin Billiet, CEO, Air Purification Skroll

atmospheric pressure, and flowed in a contra flow direction through column B to affect its regeneration. When the first column (A) is saturated with water vapor (usually determined by a simple timer) the feed air (following repressurization) is switched back to column B and the cycle continues.

Beaded adsorbent designs may suffer from accidental misuse with excessive water loading if, for example, reduced pressure, or excessive flow, or excessive temperatures are encountered. Desiccant beads shed dust, especially when operating in challenging environments where, for example, shock and vibration are present. Operating in a horizontal orientation is a real challenge for adsorption beads.



APS Sizing Parameters

ISO 8573.1 humidity class 2 (-40 ˚C/ ˚F PDP) is often specified but, for many applications, this far exceeds the dryness required and therefore a dryer may be oversized and use excessive purge air (energy).

Skroll technology allows the user or designer to determine the dryness of the air to suit their application requirements by maintaining stable DPS or %RH over a wide range of conditions. Skroll technology is highly efficient, reliable and requires little or no maintenance. The medium has been developed for demanding applications in the purification of compressed air. It overcomes the disadvantages of adsorbent beads such as channelling, by-pass, bed fluidization, orientation, dust generation, misuse (flooding), short service life and degradation due to high water loading.

Traditionally many beaded desiccant dryers operate on a 4-minute cycle (2 minutes drying and 2 minutes regeneration and re-pressurization). At 7 bar (100 psig) bed volume equates to approximately 200 Nl/ min/litre or 0.12 scfm/cubic inch of flow per

INNOVATIVE ADSORPTION MEDIUM FOR PRESSURE SWING DESICCANT AIR DRYERS

volume of adsorbent bed. Pressure losses across beaded adsorption beds are typically up to 140 mbar (2 psi).

The Skroll medium operates at a 40 ˚C (104 ˚F) inlet temperature, 100% RH and 7 bar (100 psig) pressure for a DPS of 40 ˚C (72 ˚F) requires just 50% of the bed volume of beaded desiccant dryers with flow per unit volumes of 400 Nl/min/litre or 0.24 scfm/cubic inch. Contact time is lower and velocity increases but pressure losses remain very low, typically <35 mbar (0.5 psi).

Flow per unit of volume may be further increased (25%) where a 2-minute cycle (1-minute drying, 45 seconds purging and 15 seconds re-pressurization) is used.

Variable and Stable Dew Point Suppression (DPS)

The sizing described relates to a DPS of 40 ˚C / 72 ˚F. Skroll medium can operate at differing levels of DPS by varying the purge volume or air flow. This can be done by either varying the purge rate or the regeneration time. By making such adjustments to the purge volume, Skroll medium will produce stable dew points in a range of 20°C - 80°C (68 ˚F - 176 ˚F) DPS. Lower DPS means less purge air required e.g. 10%.

ISO8573.1 Quality Classes for Humidity

Humidity Class 2 may be specified without consideration being given to inlet conditions. ISO8573.1 simply states quality classes, it does not specify inlet conditions to achieve them. To achieve Class 2 for water (-40 ˚C/F) a Skroll module may be sized to have increased DPS depending on the inlet conditions being specified. For a 20 ˚C (68 ˚F) inlet temperature, a 60 ˚C (108 ˚F) DPS will produce a ISO8573.1 humidity class 2 of -40 ˚C/F.

Continental weather may vary from -40 ˚C/F in the winter to +40 ˚C (104 ˚F) in the summer. Specifying compressed air dryness of 20% RH or 40 ˚C (72 ˚F) DPS prevents condensate forming in the system throughout the year. It prevents condensation in the summer which would wash out lubricants in pneumatic equipment (even more damaging if condensed water combines with oil and desiccant dust to form an abrasive sludge). In the winter, freezing of condensate will render equipment

Applications

Skroll medium is not a straight replacement for beaded technology since many desiccant dryers operate successfully in fixed locations where ambient temperatures, pressures and flow are controlled, and where servicing and supervision is readily available. Skroll medium has been developed specifically for use in arduous conditions where beaded PSA and membrane dryers are challenged beyond their normal operating parameters. Applications include where:

- Extremes of temperature and humidity prevail
- Extended life is required
- Shock and vibration are present
- Service is not readily accessible e.g. Transport, mobile, off-shore, and remote locations
- The total life cost needs to be reduced
- Space is a constraint
- System misuse is probable
- Protection of air separation membranes is needed
- Dryers are subjected to stop/start and/or pulsing conditions
- Membrane dryers are subject to chemical attack
- System pressures are higher e.g. 40 to 350 bar

inoperative and is of particular concern during the overnight parking of vehicles.

NF F11-100, commonly used in rail, specifies a 40 ˚C (72 ˚F) DPS which recognizes seasonal variations.

Recovery from Misuse

There are many misuse scenarios including excessive volumetric flow. This increases the water loading resulting in a reduction in DPS. Crucially Skroll medium adjusts to a new and stable dew point which is unlikely to cause any short-term problems since condensation should not occur.

In extreme cases (where for example there was an interruption of power supply to the dryer) the normally open inlet valves would 'fail open' and maintain air supply. The Skroll medium would become saturated, however, once the power supply is resumed and the dryer starts to cycle, the Skroll medium will quickly recover its performance. The graph illustrates the loss of PDP over a period of several hours. Full recovery of performance is achieved within an hour of normal conditions being resumed. In such scenarios, traditional adsorption beads would, most likely, need to be replaced.

Pressure Losses

Pressure losses across some purification systems can be significant, made up from inlet filtration, dryer and outlet filter. Initial pressure losses may be as much as 0.7 bar (10 psi). This Differential Pressure (DP) may increase further as the pressure drop across the filters increases in use. Filters from the pneumatics industry are typically fitted with sintered elements of various micron ratings. They have high pressure losses especially when compared to developments in compressed air treatment. Such developments have resulted in highly efficient designs with very low and sustained pressure losses with no serviceable parts. This saves energy and results in significant through life cost savings.

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INNOVATIVE ADSORPTION MEDIUM FOR PRESSURE SWING DESICCANT AIR DRYERS

Scroll in housing.

Filtration

Many of the new compressed air systems use non- lubricated piston compressors and it is possible when using a Skroll dryer to dispense with the high efficiency coalescing inlet filters as well as the outlet dust filter.

A new Inlet Filter design developed for use with Skroll dryers produces air quality to ISO8573.1 quality class 3 for dirt and class 7 for water respectively (typically +99% removal of dirt particles down to 5 micron and water condensate). This new Inlet Filter operates using 2 powerful mechanisms of filtration: centrifugal separation and scrubbing action (removal of smaller particles). There are no service parts and pressure losses are very low and remain low in use, typically 50 mbar (0.7 psi).

For non-lubricated compressors, only one Inlet Filter is required. The overall pressure losses across the inlet filter and dryer using Skroll medium are in the order of 300 mbar (4 psi) representing a significant energy saving of up to 5% of compressor power.

For oil lubricated compressors, a second stage high efficiency coalescer is required to remove residual oil aerosols.

The use of piston compressors raises other issues, such as pulsation and aggressive condensate. Increased corrosion protection of the filters is necessary, while high efficiency filter elements must be of a construction to prevent rupture of the delicate material used in their construction. Generally, industrial filters are not designed to withstand pulsations and stop/start conditions. BP

About the Author
Colin Billiet is the CEO of Air Purification Skroll Limited and the former CEO of the domnick hunter group PLC.

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To read more about ***Compressed Air Purification Technology*** please visit, www.airbestpractices.com/technology/air-treatment

Compressor Room Advantages with OIL-FREE CENTRIFUGAL AIR COMPRESSORS

By the Compressed Air & Gas Institute – Centrifugal Compressor Section

CAGI Compressed Air & Gas Institute
www.cagi.org

Members of the CAGI Centrifugal Compressor Section

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- Ingersoll Rand

➤ Introduction

Today's industrial manufacturing environment is extremely competitive, requiring companies to constantly search for cost saving opportunities and better efficiencies. In many cases, manufacturers find that centrifugal air compressors are a successful method for reducing the overall plant costs involved in supplying compressed air.

Understanding Centrifugal Technology

Before investigating the benefits of centrifugal air compressors (See Figure 1), it is important to understand the technology behind the compressor.

Centrifugal, sometimes referred to as dynamic compressors, work by transferring kinetic energy from a rotating impeller into potential energy (pressure) in the diffuser. As an impeller accelerates the air, a radial diffuser converts

the air velocity into pressure converting kinetic energy into increased pressure. Centrifugal compressors typically feature multiple stages within the design. Between each stage, the air is cooled with an intercooler before moving on to the next stage which also increases the compressor efficiency. Due to the continuous flow through the multiple stages, centrifugal compressors are designed to thrive with higher capacities and are best suited for applications above 200 total horsepower.

Centrifugal Air Compressors Deliver Class 0 Certified Oil-Free Air

Centrifugal air compressors, as well as some rotary screw air compressors, can supply oil-free air, often referred to as Class 0 per ISO 8573-1. It is important to understand that the Class 0 designation is distinctly different from trace oil designation. Figure 2 presents the classifications of oil-free air. Employing a Class 0 certified centrifugal compressor provides numerous benefits to a manufacturing facility including minimized maintenance, reduced energy costs and an oil-free airstream (assuming the source inlet air is also hydrocarbon free).

Oil-Free Airstream

For some manufacturing plants having trace oil in their compressed airstream is not an issue. But for companies that produce textiles, food products, electronics or even medicines, oil-free, dry air is essential to the manufacturing process. An oil-free airstream eliminates the risk of trace oil reaching the finished product or oil contamination in pneumatic equipment lines leading to higher maintenance and downtime.

Producing an oil-free airstream gives a further advantage because the condensate that is generated by the compressor drain traps is not subject to local regulations that control condensate contaminated with oil, and so it can be disposed of easily and at a much lower cost.

Consumables

All air compressors rely on consumable products, such as filters, separators, and oil, which need to be replaced on a regular basis. The amount of consumable products can vary greatly based on compressor technology. Oil-free compressors do not use oil in the actual compression process, which keeps the oil in the machine out of the actual air path. Minimizing the oil introduced in the air path will reduce the risk of getting oil carryover in the airstream. It also minimizes the number of filter change-outs downstream, keeping costs down.

COMPRESSOR ROOM ADVANTAGES WITH OIL-FREE CENTRIFUGAL AIR COMPRESSORS

Figure 1: Typical Centrifugal Air Compressor

Class	Concentration Total Oil (mg/m³)
0	As specified by the equipment user or supplier and more stringent than class 1
1	≤ 0.01
2	≤ 0.1
3	≤ 1
4	≤ 5

Figure 2 - ISO 8573-1 classifications for oil-free air

In addition to the filtration required to keep the air clean, there is the cost of the oil itself. Although oil-free compressors still require oil, it never goes into the compression process. Only minimal amounts are used to lubricate bearings and seals. If a business is unsure of which unit would work best for their application they should ask, "What will the impact to my business be if there is trace oil in the air system?" The less reliance on oil in a machine lowers the risk of oil carry-over in the air path. Could you be subjecting your business to warranty claims or quality recalls if your product is released with trace oil residue? If you use pneumatic controllers or instruments, the impact could be substantial in downtime and maintenance from oil contamination in the air system lines.

Designed for Lower Maintenance Requirements

Centrifugal air compressors have very few moving parts and key components such as rotating assemblies, bearings, and seals can be easily field serviced. With minimal contacting or wearing parts, reliability is greatly improved and costly downtime minimized. In many cases, centrifugal compressors have remained in service up to 20 years before major overhauls are necessary.

"With minimal contacting or wearing parts, reliability is greatly improved and costly downtime minimized. In many cases, centrifugal compressors have remained in service up to 20 years before major overhauls are necessary."

— the Compressed Air & Gas Institute – Centrifugal Compressor Section

Centrifugal compressors also offer the elimination of the need for oil/water separation units. Condensate from the air compressor drain-traps will likely have oil mixed with the water in oil-flooded machines. Centrifugal compressors have minimal oil in the condensate thus eliminating the need to remove the oil via an oil/water separator before the water discharged properly. The elimination of the maintenance and costs associated with the oil/water separator can help facilities minimize labor and consumable costs.

Highest in Terms of Energy Efficiency

Power or energy is by far the largest cost of operating an air compressor, so it is not surprising that energy efficiency often comes up in the conversation when discussing the benefits of centrifugal compressors. In many cases, a centrifugal compressor can offer some of the highest energy efficiency. Centrifugal compressors operate best at full capacity and are often used for base-load machines. In this capacity, demand is relatively constant and other air compressor technologies are used for trim machines. When centrifugal compressors are operating at full capacity and a constant air supply, efficiencies can exceed other technologies by 5%. This will vary based on the plant-load requirements and the application of a plant's total air delivery system.

Centrifugal compressors also typically employ inlet guide vanes to control the flow of air into the compressor. Inlet guide vanes reduce the amount of power required over traditional butterfly valves, by creating a pre-swirl condition to the air stream delivering excellent part-load performance and energy benefits over a wide range.

There are also various control system settings available on a centrifugal compressor that can maximize energy savings or efficiency. The control management will vary by manufacturer however typical controls include the ability to automatically adjust the compressor surge control line based on changes in environmental conditions. This allows plants to maximize the turndown and minimize the bypass air, ensuring the unit is always running at peak efficiency. Another management tool is the ability to adjust the high and low discharge set points to meet plant demands. Finally, one of the most useful is the ability to link compressors in sequence to minimize the number of compressors for the required demand.

Conclusions

Centrifugal air compressors are best suited for manufacturing plants that require higher flows and a steady supply of oil-free air. When operating expenses are of concern, centrifugal compressors can provide a higher efficiency rating as well as lower maintenance costs. The oil-free air path provides numerous benefits downstream in the manufacturing process that, depending on the manufacturing application, could have large financial returns. In general, manufacturers that require a total of over 250-300 horsepower should consider the benefits centrifugal compressors could offer and how those benefits could help the company achieve their objectives.

For more information visit www.cagi.org

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Missed Opportunities in Compressed Air System Design
FLOW RESTRICTIONS FROM PIPE HEADERS

By Hank van Ormer, Contributing Editor

➤ Introduction

Technology is progressing at astounding rates in the control and monitoring of compressed air use. Many are familiar with the advances with improved technology in the compressed air supply. Such advancements as, proactive central air compressor controls to maintain optimum operation of multiple compressors to support ever changing air demands; improved drive systems such as VSD's; magnetic bearing drives (centrifugals); and more efficient and reliable equipment taking advantage of modern manufacturing capability. These new technologies are very important in generating relative high energy cost savings, and are well promoted by the OEM equipment manufacturers.

This same trend of advanced technology use is happening and supporting many processes commonly used on the production floor. A common trait of these innovations and controls is they individually have very low initial cost and generate very solid savings – often with quick payback. And because of the low initial cost, these devices often aren't supported with aggressive, knowledgeable

> "When evaluating compressed air systems and looking for production area savings, we often recommend products which have been on the market for many years, and yet, are received by the operating plant personnel with surprise."
>
> — Hank van Ormer, Contributing Editor

sales representation at many operating locations.

When evaluating compressed air systems and looking for production area savings, we often recommend products which have been on the market for many years, and yet, are received by the operating plant personnel with surprise.

This series of articles is dedicated each month to showcase some important, but often undiscovered, technologies. We will describe the devices in detail and supply specific case studies when available. We believe this will offer affordable and easy to implement ideas to lower compressed air use and generate energy savings in many operations.

Can Compressed Air Supply Translate Lower Demand Into Input Energy Reductions?

Remember, compressed air is the most expensive utility in many plants. A minimum of about 8 hp electric input is required to produce 1-hp of work with compressed air. Before starting to evaluate the compressed air use reduction opportunities, discuss how to ensure your compressed air supply is set up properly to be able to effectively convert lower air demand into a commensurate reduction in input energy.

Experience has shown the savings in energy with production-floor opportunities often exceeds the most common supply side modifications. Due to the constant changing dynamics in the production areas, such factors as production changes, addition or reduction in production lines, and minor modifications that grow and can become major opportunities. The production areas require proper and meaningful monitoring of the KPI's (key performance indicators) on a continuing basis, as well as the supply side.

In the case of the supply side, you want to be sure you are producing the needed compressed air at optimum efficiency. In the production area, you want to only use what you have identified as the optimum flow at the minimum pressure to ensure productivity and quality standards are met or exceeded.

This column does not allow enough room to fully identify all the supply side issues in equipment – storage, capacity controls,

MISSED OPPORTUNITIES IN COMPRESSED AIR SYSTEM DESIGN

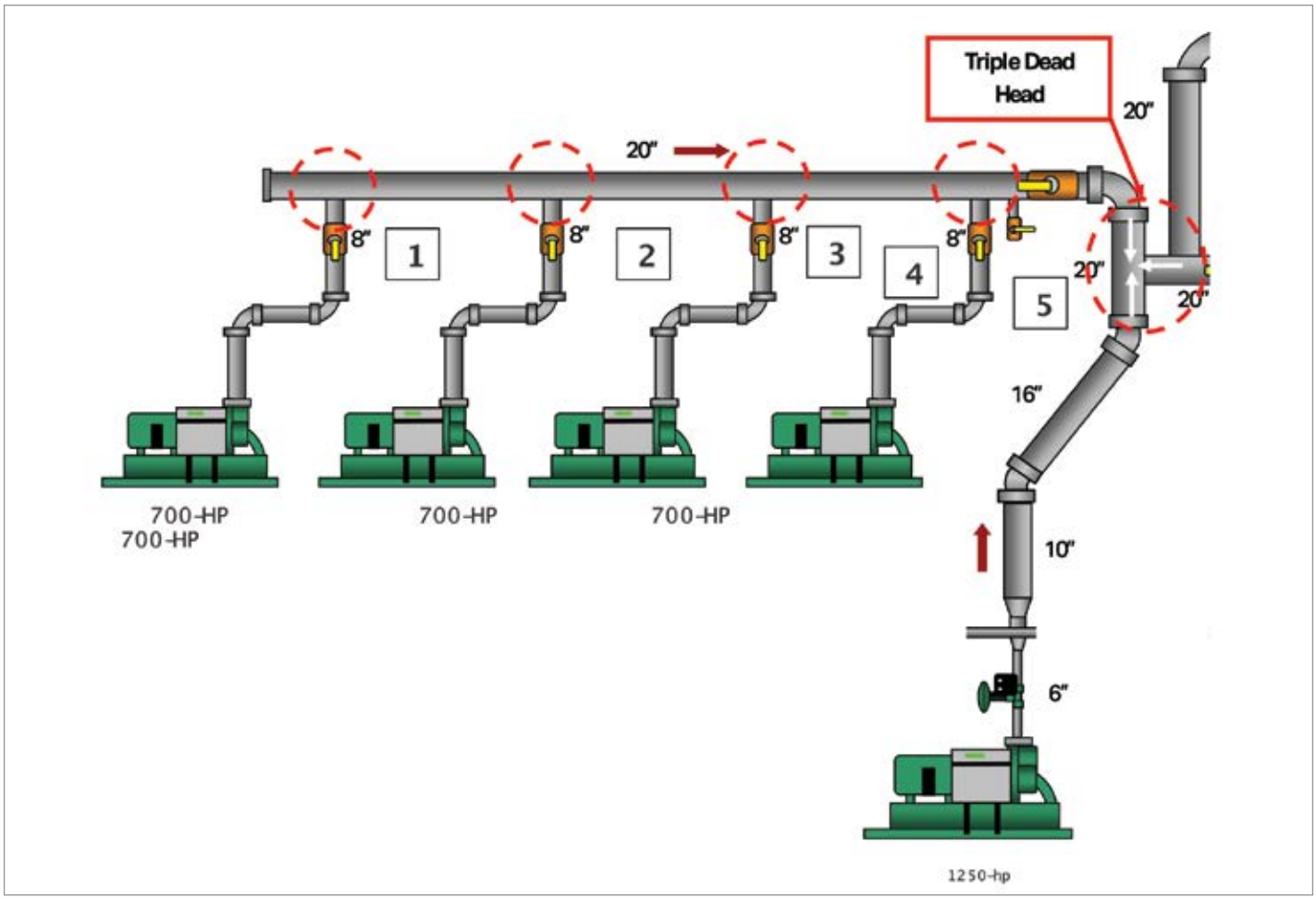

Figure 1. Pipe Headers

UNIT #	FULL LOAD KW	FULL LOAD AIR FLOW (SCFM)	ACTUAL KW	ACTUAL AIR FLOW % OF FULL FLOW	ACTUAL AIR FLOW ACTUAL SCFM
Operating at 60 psig discharge pressure for 8,760 hours					
1	107.8	700	85	79%	545
2	279	1,947	138	49%	953
3	279	1,947	164	59%	1,135
4	279	1,947	42	15%	289
5	279	1,613	261	93%	1,513
6	298.4	1,910	34	10%	195
7	631	4,505	Off-Down		
8	631	4,587	534	81%	3,705
9	631	4,587	491	73%	3,283
10	631	4,587	478	72%	3,252
11	932	7,416	912	92%	6,836
			TOTAL (Actual): 3,139 kW		**21,706 scfm**

Figure 2. Measured Actual Operation Conditions

piping, condensate handling – that impact on the ability of the supply to effectively translate less demand side usage into lower input energy. However, here are some very common examples to illustrate the importance of this point. This is almost always the first step.

Flow Restrictions from Pipe Size and Configuration

Too high of velocities, due to undersized piping, and dead heads and crossing tees in multiple unit systems are caused by improper piping configuration. Together these restrictions can cause multiple (or even all the supply compressors) to run at part load. They cannot reach full load within an acceptable operating band.

We will illustrate this with an example. The plant air system in Figure 1 had a number of centrifugal compressors piped into a common header. Plant personnel felt most of the units were at full load as indicated by the master controller. However, as shown in the red dashed circles, the common header was experiencing crossing tee's 1 through 4 and the triple dead head 5. The compressors are mass flow centrifugals and any sensed back-pressure or resistance to flow increased the mass flow which reduced the volume of inlet air delivered to the same mass flow.

As shown in Figure 2, measured operating data of the 5 units in Figure 1 were running along with five other units feeding into the triple dead head. A total of ten units were loaded in with 31,241 scfm available, delivering 21,706 scfm at 60 psig at 3,319 kW.

This is an extreme example. It illustrates if you reduce the air demand on the demand side you may have little or no input energy reduction on the total electric power energy input. Some of these units are running in turndown but others are in blow off. Reduction in air flow demand from production will probably result in increased blow off and little or no change in input electric energy.

Implemented/Corrected Piping and Results

- Two older 700-hp units were replaced with new, higher efficiency 1,250-hp class units (also with greater turndown).
- The 20" collector header was increased to a 30" stainless steel, Schedule 10 header.
- All connections were angled directional entry to eliminate the turbulence from the crossing tees.
- The Triple Dead Head was eliminated.
- The total load of 21,706 scfm was delivered by 2,796 kW with the implemented production air savings this load became the peak and full production was continuously carried by the three newer 1,250-hp units with the older 700-hp units in backup.
- At 21,706 scfm/60 psig, the original annualized input energy power was 3,139 kW. The energy 27,497,640 kWh at .09 kWh = $2,474.788/year.
- With the piping and configuration change and two new units at the same flow and pressure would be:
  - Input power 2,796 kW / 24,492,960 kWh @ .09 kWh = $2,204,366/year
  - An electrical energy savings of $270,421/year

MISSED OPPORTUNITIES IN COMPRESSED AIR SYSTEM DESIGN

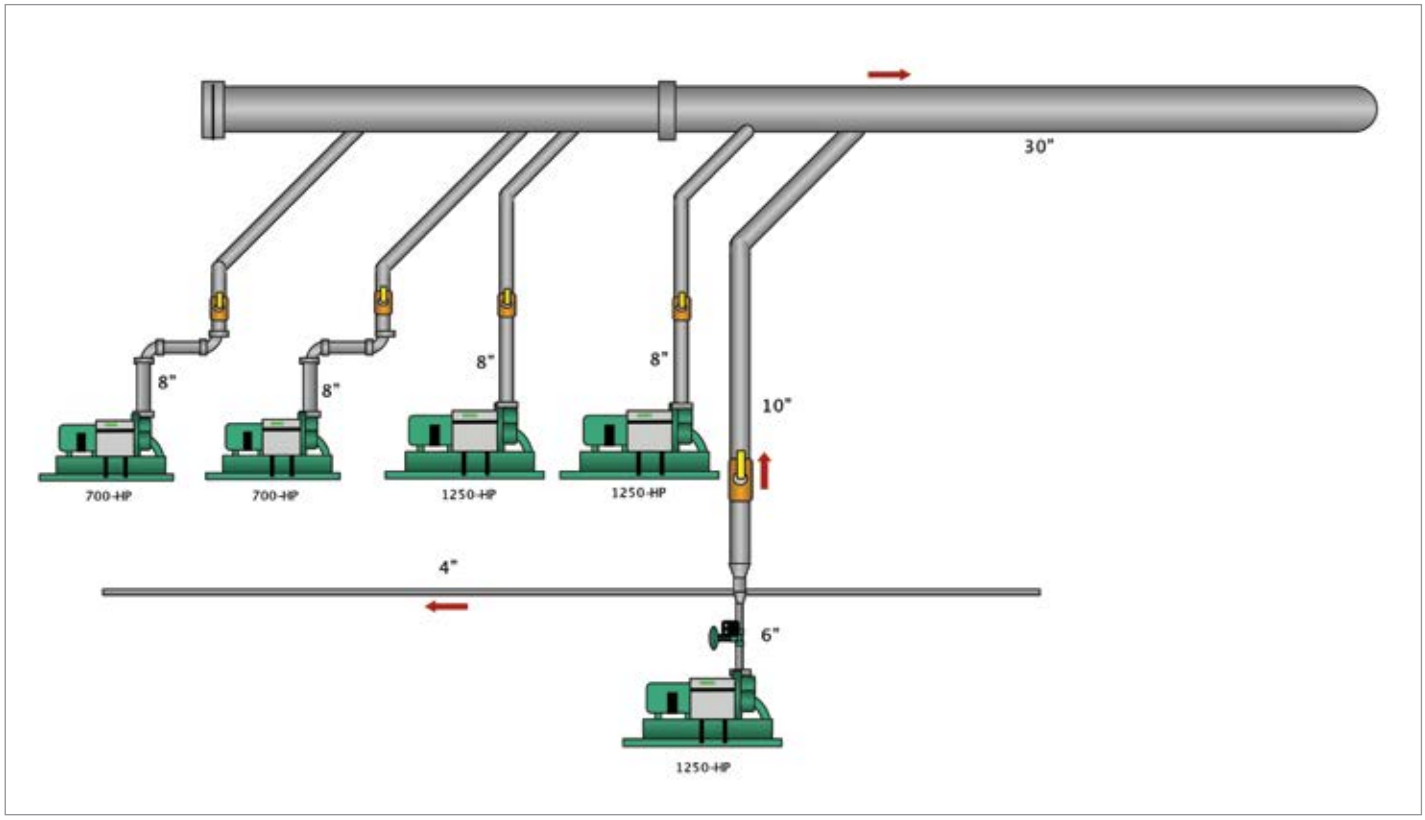

Figure 3. After the piping correction, all of the units can deliver the full air supply to the system.

The new, more efficient, larger centrifugals probably improved the full load specific power 10%. The rest of the savings came from piing and system design modification.

A similar effect will happen regardless of the types of control when the local compressor capacity controls react to sensed changes in the interconnecting piping not related to actual production area operations but are generated in the compressor room.

When all of these types of issues are solved and the supply and demand sides of the total air systems are properly linked together, all reductions in air demand can be translated in lower input energy.

Since this is an ongoing column, we encourage feedback on the discussions. Next issue we will address some new products and air technologies which offer significant air reduction at low capital cost and usually a short simple payback. BP

We hope you've found this interesting and look forward to your comments! Contact Hank van Ormer, email: hankvanormer@aol.com

UNIT #	FULL LOAD		ACTUAL KW	ACTUAL AIR FLOW	
	KW	AIR FLOW (SCFM)		% OF FULL FLOW	ACTUAL SCFM
Operating at 60 psig discharge pressure for 8,760 hours					
New	932	7,416	932	97.6%	7,235
New	932	7,416	932	97.6%	7,235
9	631	7,416	OFF		
10	631	4,587			
11	997.7	4,587	987.7	97.6%	7,235
TOTAL (Actual): 2,796 kW					**21,706 scfm**

Figure 4. Corrected Operation Conditions.

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SHOW REPORT
Chillers, Vacuum and Compressed Air at the 2018 IPPE Expo

By Wes Lucko, Compressed Air Best Practices® Magazine

➤ The 2018 International Production & Processing Expo (IPPE) projected to bring together more than 1,150 exhibitors and 30,000 visitors to Atlanta, from Jan. 30 - Feb. 1, 2018. The tradeshow focuses on bringing together leaders in the poultry, meat and feed industry from all over the world. IPPE's global reach attracts more than 8,000 international visitors from 129 countries.

Compressed Air Systems

Kaeser container solutions are tailored to individual customer needs and can be operated in temperature ranges from -58 ˚F (-50 ˚C) to 113 ˚F (+45 ˚C). Ambient temperatures over 113 ˚F (+45 ˚C) require alternative turnkey solutions. Low-temperature steels are used for temperatures below -58 ˚F (-50 ˚C). The compressor packages are manufactured according to specific customer and country requirements.

The systems are tested at the Kaeser plant where the agreed operating parameters are preset. If the compressed air installation comprises multiple containers, they ensure they can be operated as a single unit, as well as in combination with one another. The system operates in conjunction with the Sigma Air Manager 4.0 Master Controller for best possible load efficiency. This type of installation reduces on-site compressor installation time to a minimum. At the Kaeser plant, they are able to operate and test multiple containers in combination and can even emulate system communication with a simulated control centre.

The containers are insulated steel units and feature ISO container corners. The containers are statically designed in such a way that they can be lifted at the upper container corners. They are completely piped and wired, and include a control cabinet with power sub-distribution, an automatic ventilation system, a heater, lighting and emergency lighting. The design is implemented in accordance with customer requirements and requests.

Kaeser uses insulated containers specially produced for each specific application. Insulated containers ensure far better thermal conditions within the container than non-insulated containers and prevent condensation from occurring on the inside. A further advantage is sound reduction and the minimization of acoustic emission to the

environment. All openings are reinforced to ensure the structural strength of the container is maintained. Rain protectors are installed above the openings in order to prevent rainwater ingress.

JAX is an industrial lubricant manufacturer focused on formulating high-performance synthetic lubricants, fleet and heavy-duty lubricants, industrial lubricants and biodegradable and food-grade lubricants.

Jax offers 100% synthetic air compressor fluids for severe operating environments. One such example would be the Compresyn HD PGE Series fluid. These are synergistic blends of synthetic polyglycols, pentaerythritol esters and selected additives formulated to provide superior performance and extended drain capabilities in rotary screw compressors. Formulated to provide 8,000+ hour drain intervals, these fluids can be run continuously for one year, eliminating fluid and labor related downtime costs during this time. The PGE Series fluids provide sealing between the rotors and the stator. Their thermal conductivity removes the heat of compression, allowing the compressor to run cooler while lubricating the rotary element bearings. The PGE Series fluids are also fully formulated synthetic compressor fluids containing no hydrocarbon-based fluids. They are highly resistant to sludge and varnish formation, and provide solvency characteristics for cutting through and dissolving varnish buildup.

Baldor showcased their stainless steel NEMA motors. The motors have an IP69K rating. The smooth finish with curved contours meets NAMI (North American Meat Institute) guidelines for ease of cleaning and allows water to shed from the frame of the motor, minimizing the chance of liquid pooling. All hardware (through bolts, drain plugs, etc.) have smooth heads to eliminate pooling and catch points. A rounded conduit box also minimizes catch points where bacteria and other microorganisms can harbor and multiply. Two barrier mechanical seals prevent water from entering the motor. The viton material is chemical resistant, withstands high temperature and directs spray. Fully encapsulated windings extending into the conduit box ensure the motor is sealed effectively inside and out. The vacuum impregnated process ensures there are no air pockets in the encapsulation.

Motion Industries talked with booth visitors about using pneumatics in the poultry industry. As automation continues to become more popular, pneumatics continues to become a more viable solution. Applications include sorting, handling, conveying and packaging. Pneumatics use directional control valve component applications to provide linear and rotary motion using cylinders, grippers and rotary actuators.

Joe D'Orazio and Michael Camber (left to right) at the Kaeser Compressors booth.

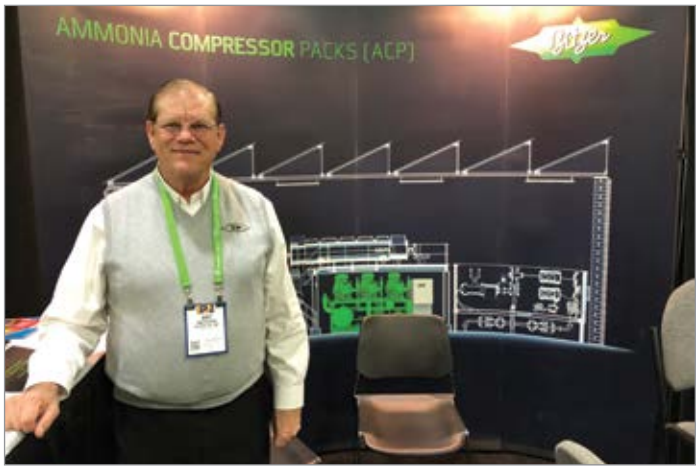
Mike Rooney and Cory Russell (left to right) at the JAX booth.

Bevan Christiansen at the Baldor booth.

CHILLERS, VACUUM AND COMPRESSED AIR AT THE 2018 IPPE EXPO

Alan McCay, Dudley Sheppard and Brad Burton (left to right) at the Motion Industries booth.

Ben Stevenson, Tim Morris, Chuck Cory and Bill Adam (left to right) at the Airgas booth.



Art Mathews at the Bitzer booth.

According to Alan McCay, Motion Industries Pneumatics Product Manager, the poultry industry has some unique conditions to deal with. Components are subjected to both hot and cold temperature extremes, high-pressure wash-down and harsh chemicals. You also must pay attention to hygienic challenges where contaminants can get trapped in small spaces and must be cleaned. Components must be designed to eliminate grooves or small spaces where contaminants can collect. The AVENTICS CL03 Clean Line series of valves were specifically designed to handle high-pressure wash-down applications. There is no need to mount the valves in a cabinet – the high flow Clean Line valves have an IP69K rating. The hygienic design allows for easy cleaning – withstanding up to 1,450 psi wash-down.

Products rated to IP69K must be able to withstand high-pressure and steam cleaning. The test specifies a spray nozzle is fed with 176 °F (80 °C) water at 80–100 bar (~1160-1450 psi) and a flow rate of 14–16 L/min. The nozzle is held 10–15 cm from the tested device at angles of 0°, 30°, 60° and 90° for 30 seconds each. The test device sits on a turntable that rotates once every 12 seconds.

In poultry plants, says McCay, there can be areas with dramatic temperature swings, which can cause water to condense in compressed air lines. In areas where it is not feasible to install an air dryer, SMC AMG series air filters are used at the point of entry before a pneumatic control valve. The AMG contains an element specifically designed to remove 99% of the water droplets. Removal of the water in a pneumatic system can help reduce corrosion of pneumatic components, therefore increasing life and decreasing downtime.

Chiller & Cooling Systems

Airgas discussed alternatives to more typical refrigerants found in mechanical chiller processes. Airgas' primary alternative is cryogenics, where gases such as liquid nitrogen, carbon dioxide and oxygen are utilized. Bill Adams, the Director of Food & Pharmaceutical Solutions spoke to me regarding the benefits of cryogenics, "It really depends on the customer's production operation. If they have a very small footprint and they need to hit temperatures of -148 ˚F (-100 ˚C) to -292 ˚F (-180 ˚C), you're probably going to be looking at cryogenics." Cryogenic freezing or chilling systems are relatively easy to operate, however the initial system design is critical to meet performance objectives. Airgas engineers will run a plant survey to find the correct gas solution and system, customizing for the individual client's needs and production

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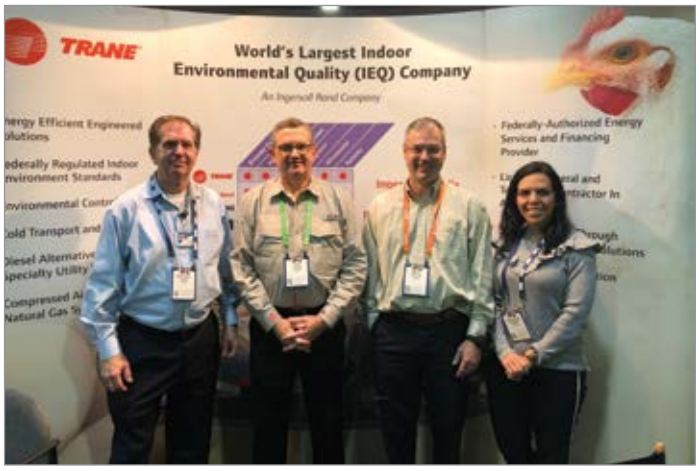
CHILLERS, VACUUM AND COMPRESSED AIR AT THE 2018 IPPE EXPO

Fernando Escuela at the Fricon booth.



Michael Snow, Don Yochum, Matt Walton and Nathalie Shaffer (left to right) at the Trane booth.

Felipe Montenegro, Elizabeth Fox, Jeremy Amos and Max Duarte (left to right) at the Evapco booth.

demands. This process includes determining the most efficient gas storage, piping, freezing or chilling equipment and exhaust systems.

Bitzer focused on their expansion to meet the demands of the industrial and commercial market with a series of screw compressor packages designed specifically for ammonia with the Bitzer Ammonia Compressor Package (ACP). All of Bitzer's ACP packages can come equipped with a variable frequency drive. The VFD ensures system stability and a more efficient part load performance than other unloading methods. Furthermore, multiple compressors greatly increases part load efficiency by keeping running compressors closer to full load, where the efficiency is highest. They also utilize internal check valves on the compressors to prevent the rotors from spinning backward when the compressor is off. An oil solenoid/stop valve is also featured to ensure oil does not flow while the compressor is not running. These features remove the need for a suction check valve eliminating unnecessary pressure drop and wasteful system inefficiency.

Fricon showcased their FMCS-P Series Modular Chiller System, Premium Series. Its air-cooled condenser satisfies a wide range of capacities. The modular design allows it to work independently in capacities between 15 to 50 TR or grouped in different combinations of sizes to form one or various sets. These meet the requirements of capacities up to 645 TR per set. Fricon uses the Bitzer Ecoline semi-hermetic compressors with infinite variable capacity control "CRII" between 10% and 100%, or the implementation of an external VFD on the master unit. This results in a greater adaptability to the thermal load of the set, stabilizing the fluid temperature and maximizing energy savings at partial load. Standard ambient operating temperature range is 110 ˚F (43 ˚C) to 40 ˚F (4 ˚C). Extended ambient operating temperature range is 125 ˚F (52 ˚C) to -35 ˚F (-37 ˚C).

Trane focused primarily on the concept of turning farm waste into methane as a way to generate further revenue for farmers. Most methane generation projects are focused toward "mega-farms" where as Trane focuses on medium sized applications, with their first project being a 500 head dairy farm. These demographics are rarely utilized in the process of methane generation. The process provides a reduced carbon footprint, reduced odor issues, reduced water pollution and improves reuse water quality. Depending on discharge quantities and digester performance, it may provide additional benefits such as power generation, fleet fuel, or pipeline injection.

Evapco showcased their Critical Process Air Systems. The unit is designed to condition recirculated air and outside air during production mode. Recirculated and outside air is filtered with pre-filters. The air is then cooled or heated as required to maintain the room return air temperature and humidity. The air then passes through the final HEPA 95 or 99 filter before being supplied to the room. CPA units are also available with an optional "free cooling" mode to increase efficiency. When conditions are favorable, the enthalpy economizer mode will open the outside air dampers on call for cooling and close the return dampers. The unit can also control room pressure utilizing the outside air and return air dampers to pressurize. Exhaust fans (remote or integral) are used to relieve the pressure.

During the optional cleanup mode, the CPA air-handling unit is designed to condition 100% outside air. The outside air will be cooled or heated as required to maintain the supply air temperature, before being supplied to the room, purging the room of moisture and chemical produced during the washing process.

Vacuum Systems

Cantrell specializes in innovative solutions in the poultry and food processing industries. One product line showcased was their Vacuum Transport System. This was designed to help clean the plant while reducing labor and water usage. The Vacuum Transport System can come in a variety of sizes in order to support plant specifications. Cantrell specifically engineers and develops each individual system based on their clients' footprint and needs. Their Vacuum Transport System can be integrated with Cantrell's own PC-based master controller system in order to have complete automated control over the entire vacuum line.

Becker showcased a wide variety of vacuum pumps, particularly the U 5 series. The U 5 series is a rotary vane oil-lubricated vacuum pump. These are primarily suited for the vacuum packaging of food. These can be used across a wide range of applications, including vacuum chamber machines, form-fill-seal machines and modified atmosphere packing (MAP). Ultimate pressure is 0.1 mbar abs. Two gas ballast valves are available, 0.5 mbar abs comes standard, and the optional <3mbar abs. Water vapor tolerance is 7 mbar at 185 ˚F (85 ˚C) operating temperature (standard gas ballast). Water vapor tolerance is 50 mbar at 185 ˚F (85 ˚C) operating temperature (optional gas ballast). The U 5 Series provides vacuum to 29.9 in.Hg (0.4 Torr).

Dane Woods and Jesse Jones (left to right) at the Cantrell booth.

Jim Sherman, Eric Schmitt, Betty Espino-Barros, Steve Gilliam, Darin Ladd, Jason Rathbun and Mick Wentzel (left to right) at the Becker Pumps booth.

About IPPE

The International Production & Processing Expo (IPPE) is a collaboration of three shows – International Feed Expo, International Meat Expo and the International Poultry Expo – representing the entire chain of protein production and processing. The event is sponsored by the American Feed Industry Association (AFIA), North American Meat Institute (NAMI) and U.S. Poultry & Egg Association (USPOULTRY). BP

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BOGE HST Developed at Smart Factory

Innovative, unique and individual to the customer – this is what the design of the BOGE HST high speed turbo compressors stands for. At more than 100,000 revolutions per minute in use, every component has to fit. To enable high-quality and faultless production, BOGE KOMPRESSOREN has invested around EUR 2 million in intelligent production at Bielefeld. A production line of 2,000 m² has now gone into operation, connecting components, technology and employees with one another.

To produce highly technical high speed turbo technology quickly and safely, employees, components and machines communicate with one another in the BOGE Smart Factory.

"Our high speed turbo compressor is the answer to the increasing demand for individual customer solutions, and greater energy efficiency at the same time," says Thorsten Meier, BOGE's CEO. "To make the production and installation of the innovative machine concept simple and safe, we have modified groundbreaking production technology for our requirements." The model for the intelligent smart factory is the SmartFactoryOWL in Lemgo. The prototypes installed there have been tested, and suitable processes for BOGE series production have been further developed. The partial conversion of an existing production area was completed within a year at the head office of the family-run company in Bielefeld-Jöllenbeck.

Zero Errors Due to Smart Interaction Between People and Machinery

A combination of digitalization, automation and craft is the solution for producing the innovative and unique BOGE HST in a range of variants, as well as with process reliability, irrespective of the wealth of experience of the employees. A digitalized assistant system enables rapid induction and ergonomic execution of complex work stages. The components "know" their characteristics and the requirements for the production. The component coding alone thereby produces a projection of the work instructions and installation information, appearing directly in the visible area. Pick-to-light facilitates the installation of the parts required, available via a modular assembly kit. The process technology automatically adjusts the component-specific relevant parameters through its connection to the ERP system. The intelligent production concept enables seamless traceabliity of relevant figures for each compressor. An Andon board gives information on the current status of the production lines at any time. The smart factory is in ongoing development. The production principle will be transferred to other series in the future.

About BOGE Compressors

BOGE America is the USA based America's subsidiary of BOGE KOMPRESSOREN Otto Boge GmbH & Co. KG based in Bielefeld, Germany. Whether for centrifugal compressors, screw compressors, high-pressure piston compressors, scroll compressors, controls, air treatment

TECHNOLOGY PICKS

equipment, complete systems or individual devices, BOGE meets the most diverse requirements and highest standards – in a precise and customer oriented manner. BOGE solutions are used by all sectors of industry to supply compressed air for a wide range of manufacturing processes. The USA Operations of BOGE America stocks the various technologies of high-quality compressors and spares for immediate support to needs. Compressed air systems are designed, sold and serviced through a dedicated network of over 50 distributors in North, Central and South America. The USA Operations is also the "Center of Excellence" for Technical Trainings for our partners to ensure Top Level Support for the consumer. For more information, visit www.boge.com.

VPInstruments Improves VPFlowScope DP

VPInstruments introduces several smart improvements on the VPFlowScope® DP. The VPFlowScope DP is the ultimate measurement tool for wet compressed air flow measurements. We incorporated three enhancements to make the flow meter even more robust to wet conditions.

The VPFlowScope DP enables you to take measurements in the discharge pipe of a compressor under 100% saturated conditions.

The probe of the instrument is now of an all laser welded stainless 316 design. Filters have been improved. Furthermore, drainage is enhanced by enlarged ports and tubes. With these new features the VPFlowScope DP has even a higher quality, longer lifetime and lower maintenance requirements.

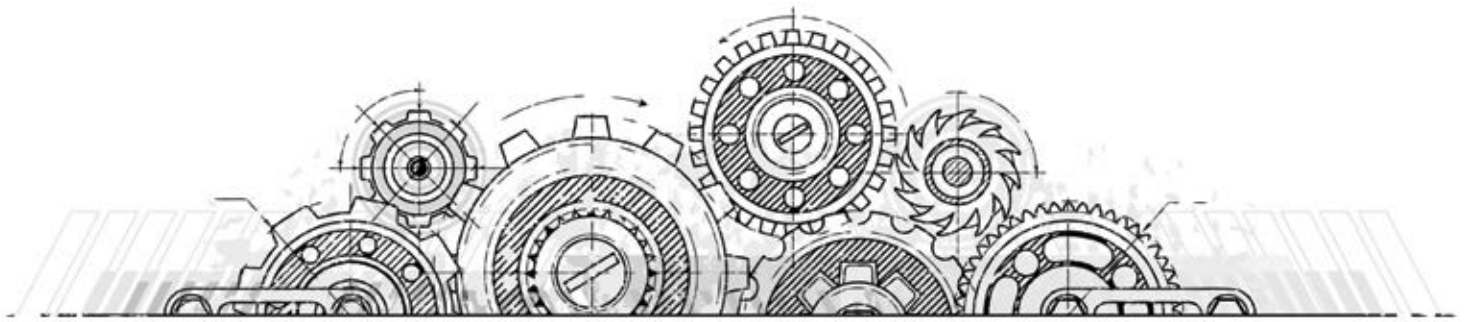
The VPFlowScope DP with its unique design, enables you to take measurements in the discharge pipe of a compressor under 100% saturated conditions. The VPFlowScope DP is thereby the perfect device for compressor efficiency monitoring.

About VPInstruments

VPInstruments offers industrial customers easy insight in energy flows. We believe industrial energy monitoring should be easy and effortless, to enable insight, savings and optimization. VPInstruments products are recommended by leading energy professionals worldwide, and offer the most complete measurement solution for compressed air flow, gas flow and electric energy consumption. Our monitoring software VPVision can be used for all utilities, and enables you to see where, when and how much you can save. Our products can be found all over the world. We serve all industrial markets, for example; automotive, glass manufacturing, metal processing, food and beverage and consumer goods. We can also help your industry. Let us open your eyes and start saving energy. For more information, please visit www.vpinstruments.com.

Kaeser Launches Redesigned ESD Rotary Screw Series

Kaeser Compressors has redesigned their ESD series of rotary screw compressors to include IE4 motors and an energy efficiency advantage of up to 30% over the competition. Kaeser's new ESD series provides flows from 820 cfm to 1,593 cfm, and pressures up to 217 psig. Thanks to their flow-optimized Sigma Profile™ rotors, these models deliver up to 5% more flow than previous models. Simple maintenance and reduced energy costs mean these models offer ultra-low life cycle costs.



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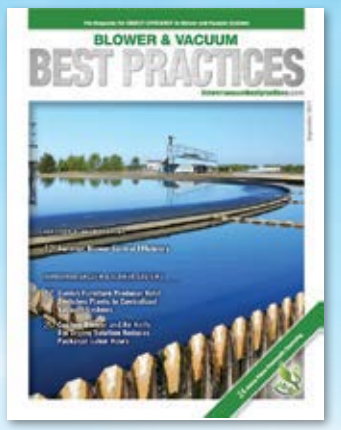

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The redesigned ESD series provides flows from 820 cfm to 1,593 cfm.

Series features include IE4 super premium efficiency drive motors, eco-friendly filter elements, integral moisture separator with drain and an Electronic Thermal Management system. Units also come standard with Sigma Control 2™. This intelligent controller offers unsurpassed compressor control and monitoring with enhanced communications capabilities for seamless integration into plant control/monitoring systems and the Industrial Internet of Things (IIoT). Built-in heat recovery options give sustainable energy savings and contribute to lowering a plant's carbon footprint.

For more information, visit www.kaesernews.com/esd. For more information or to be connected with your local authorized Kaeser representative, please call (877) 596-7138.

About Kaeser

Kaeser is a leader in reliable, energy efficient compressed air equipment and system design. We offer a complete line of superior quality industrial air compressors as well as dryers, filters, SmartPipe™, master controls, and other system accessories. Kaeser also offers blowers, vacuum pumps, and portable gasoline and diesel screw compressors. Our national service network provides installation, rentals, maintenance, repair, and system audits. Kaeser is an ENERGY STAR Partner.

Endress+Hauser Introduces Field Xpert SMT70 Tablet PC

Endress+Hauser introduces the Field Xpert SMT70, a rugged tablet PC for commissioning and maintenance staff to manage field instruments and document the work progress. The tablet comes preinstalled with DeviceCare device configuration software and device library, so it is ready to go, right out of the box.

The Field Xpert SMT70 supports HART, PROFIBUS DP/PA, FOUNDATION Fieldbus, Modbus, CDI and Endress+Hauser service interfaces. It can connect to field instrumentation devices directly via a USB or Bluetooth wireless modem, or via a gateway, remote I/O or multiplexer to a bus system.

The Field Xpert device library has more than 2,700 pre-installed device and communication drivers, allowing it to work with many different instruments from a wide variety of vendors. The drivers can be used to communicate with virtually all HART and FOUNDATION Fieldbus devices, and additional device drivers (DTMs) can be easily installed if required. Generic HART DTM and PROFIBUS profile DTMs also enable communication with field devices using these protocols.

The Field Xpert SMT70, therefore, works with virtually every modern field instrument with "One Click Connectivity." To connect the Field Xpert SMT70 to a HART flowmeter, the operator simply clicks on the app, prompting the user to select Automatic Connection and the app connects to the instrument, then the tablet is ready to perform diagnostics, configurations or commissioning with the built-in device configuration software. The tablet also supports Endress+Hauser Heartbeat Technology and FieldCare instrument diagnostic and monitoring functions.

The tablet PC has Windows 10 Pro software installed. It comes with an 11.6 inch Multitouch HD display, a 5MP auto focus camera, a 2MP front facing camera, and up to 256 GB storage. Communication ports and supported networks include USB, Ethernet, HDMI, Wi-Fi

The Field Xpert SMT70 has more than 2,700 pre-installed device and communication drivers.

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and Bluetooth—with 4G LTE and GPS available as an option. The battery runtime is 14 hours. The tablet comes in a general purpose configuration as well hazardous area configuration for Class 1, Division 2 Groups A,B,C,D, T4 and Class 1, Zone 2, Groups IIC, T4.

For more information visit www.us.endress.com/SMT70

About Endress+Hauser in the U.S.

Endress+Hauser is a global leader in measurement instrumentation, services and solutions for industrial process engineering. Endress+Hauser provides sensors, instruments, systems and services for level, flow, pressure and temperature measurement as well as analytics and data acquisition. We work closely with the chemical, petrochemical, food & beverage, oil & gas, water & wastewater, power & energy, life science, primaries & metal, renewable energies, pulp & paper and shipbuilding industries. Endress+Hauser supports its customers in optimizing their processes in terms of reliability, safety, economic efficiency and environmental impact. The Group employs 13,000 personnel worldwide and generated more than 2.2 billion dollars in 2016.

The Endress+Hauser Group

Endress+Hauser is a global leader in measurement instrumentation, services and solutions for industrial process engineering. The Group employs 13,000 personnel across the globe, generating net sales of more than 2.1 billion euros in 2016.

For further information, please visit www.endress.com/media-center or www.endress.com.

ISA-60M Oxygen Monitor from ENMET

Maintaining the quality of breathing air in a Magnetic Resonance Imaging (MRI) facility is vital to the health and safety of patients, MRI technologists and hospital maintenance staff. MRI systems use compressed (liquid) helium, a nontoxic, odorless, colorless nonflammable gas, to cool down the superconductive magnets in MRI scanners. There is a potential risk of the helium being released from the MRI system. This can be due to equipment malfunction, power outage or some form of extreme magnetic or vibrational disturbances. If helium escapes from the MRI system, helium gas can be released into the atmosphere of the MRI room, and will quickly displace oxygen, reducing the concentration of oxygen in the atmosphere to unsafe levels.

Reduced oxygen levels can cause fatigue, confusion and disorientation without individuals even being aware. If oxygen levels are further reduced, fatalities may result in minutes. This puts the technician, patients and anyone in or entering the MRI room in danger.

ENMET has been providing MRI facilities with oxygen deficiency monitors since MRI machines first came into use. Our ISA-60M oxygen monitor and alarm systems with remote MRI-5175 oxygen sensor transmitters have been installed in MRI facilities worldwide. The MRI-5175 is installed inside the MRI room and will continuously monitor oxygen levels, and communicate through a 4-20 mA output, plus RS-485, to the ISA-60M controller. The ISA-60M is mounted in the control room for MRI operators to observe during MRI scanning procedures.

If the oxygen in the atmosphere goes below unsafe levels, visual and audible alarms will indicate dangerous conditions and alert staff. When designing an MRI room, consider incorporating ENMET's ISA-60M with an MRI-5175 to provide more confidence in keeping patients and staff safe.

Contact our ENMET Sales Team today for more information. For more information on ENMET, please visit www.enmet.com.

The ISA-60M and MRI-5175 continuously monitors oxygen levels and communicate through a 4-20 mA output.

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New Filter Cap for EE871 Probe from E+E Elektronik

The digital **EE871 probe** measures **CO_2 concentration up to 50,000 ppm** (5 % CO_2). The compact probe is now available with a **special filter cap,** optimally **protecting the measuring electronics against hydrogen peroxide.** This opens up new applications for the EE871, particularly in the pharmaceutical and biotech industries, where H_2O_2 is used for cleaning and sterilization purposes.

High Performance Measuring Principle

The dual-wavelength NDIR measuring principle of the EE871 is inherently insensitive to contamination. The multi-point CO2 and temperature factory adjustment ensures a high measuring accuracy over the entire temperature range from -40 ˚C to 60 ˚C (-40...140 ˚F). The measured data is optionally available on the Modbus RTU interface (up to 10,000 ppm) or the E2 interface (up to 50,000 ppm).

In a Set Also with Analog Output

The CO_2 probe is additionally available as a set with a conversion board and a connection cable up to 10 m long. The conversion board features an analog output (current/voltage), as well as a Modbus RTU interface and allows for easy integration into the application.

Further Features:

- Outstanding long-term stability
- Auto-calibration
- Temperature compensation
- Adapter-kit for easy configuration and adjustment
- IP65 enclosure

For more information, please visit www.epluse.com.

The digital EE871 probe is now available with a special filter cap, optimally protecting the measuring electronics against hydrogen peroxide.

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Compressed Air Best Practices® is a technical magazine dedicated to discovering **Energy Savings** in compressed air systems — estimated by the U.S. Department of Energy to represent 30% of industrial energy use. Each edition outlines **Best Practice System Assessments** for industrial compressed air users — particularly those **managing energy costs in multi-factory companies.**

"We had three 900 hp air compressors. A big part of the reduction was getting the right air compressors in place."

– Bob Nelson, Engineering Manager, Ball Corporation, Saratoga Springs (NY) Facility (feature article in March 2017 Issue).

"We performed a compressed air leak survey at a refinery identifying 1,726 leaks resulting in 13,324 cfm of lost air to leakage."

– James Nipper, Vice President, Petro Chemical Energy (feature article in May 2017 Issue).

"Demand Side" and "Supply Side" information on compressed air technologies and system assessments is delivered to readers to help them save energy. For this reason, we feature Best Practice articles on when/how to correctly apply **air compressor, air treatment, piping, storage, measurement and pneumatic control technology.**

Industrial energy managers, utility incentive program managers, and technology/system assessment providers are the three stakeholders in creating energy efficiency projects. Representatives of these readership groups guide our editorial content.

"The membrane dryers are able to drop the pressure dew point to -121 ºF (-85 ºC) for the laboratory."

– From April 2017 feature article; "NMR Spectroscopy Lab Requires a -112 ºF Dew Point and Pure Nitrogen."

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